FIG. 1

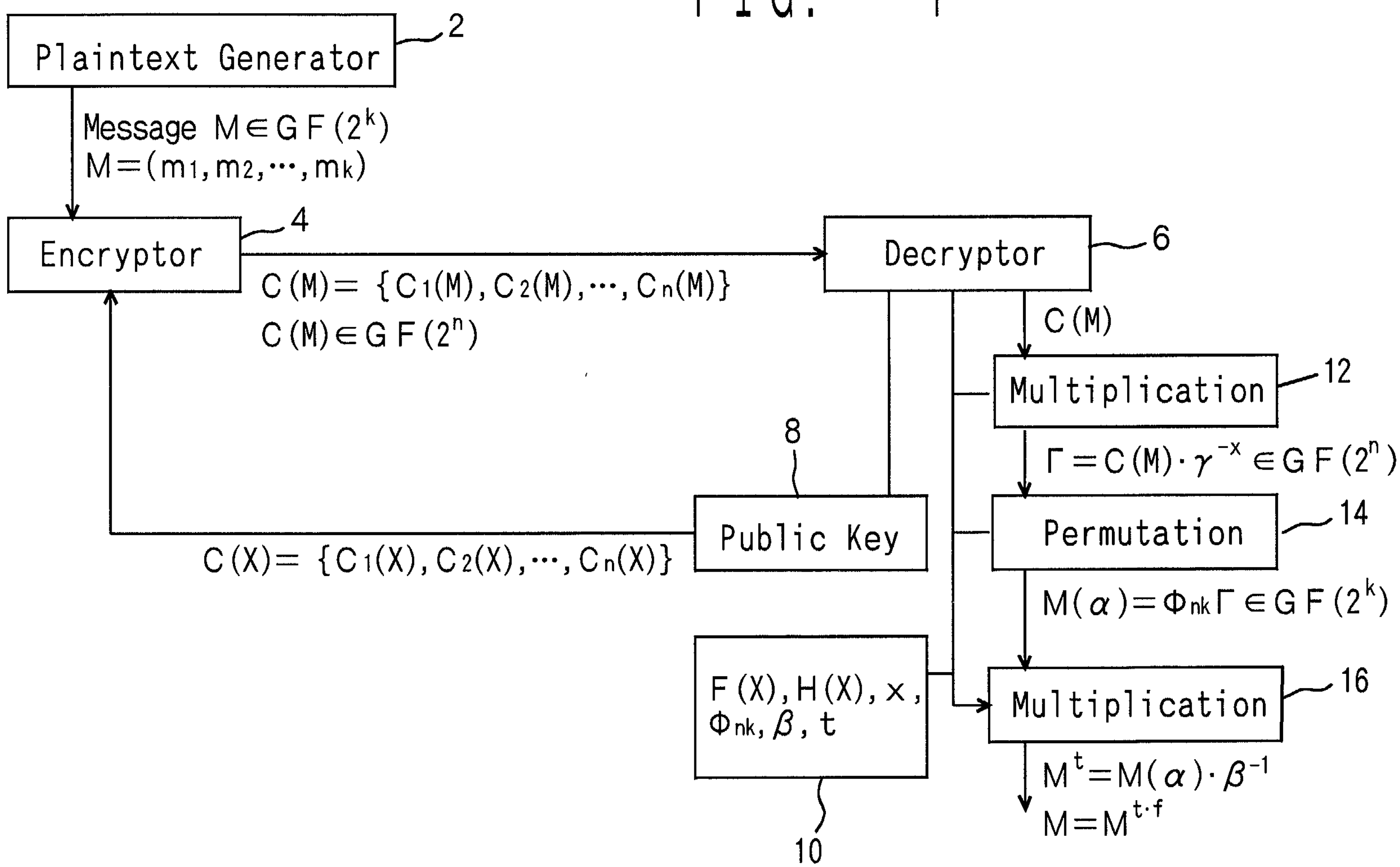

Plaintext Generator
2
Message $M \in GF(2^k)$
$M=(m_1, m_2, \cdots, m_k)$
Encryptor
4
Decryptor
6
$C(M)=\{C_1(M), C_2(M), \cdots, C_n(M)\}$
$C(M) \in GF(2^n)$
$C(M)$
Multiplication
12
$\Gamma = C(M) \cdot \gamma^{-x} \in GF(2^n)$
Permutation
14
$M(\alpha) = \Phi_{nk} \Gamma \in GF(2^k)$
Multiplication
16
$M^t = M(\alpha) \cdot \beta^{-1}$
$M = M^{t \cdot f}$
Public Key
8
$C(X)=\{C_1(X), C_2(X), \cdots, C_n(X)\}$
$F(X), H(X), x,$
Φ_{nk}, β, t
10

FIG. 2

Encryption Procedure

Take of message M as an element in a Galois field GF(2^k) and Operate with secret polynomials $\beta_1(\alpha),\cdots,\beta_t(\alpha)$

F (X) : Primitive polynomial in G F (2^k),

$F(\alpha)=0$,

$M(\alpha)=M^{\beta_1(\alpha)}\cdot M^{\beta_2(\alpha)}\cdots M^{\beta_t(\alpha)} \bmod F(\alpha)$

Scramble $M(\alpha)$ with noise $r(\alpha)$:

$$\left.\begin{matrix} M(\alpha) \\ r(\alpha) \end{matrix}\right| \xrightarrow[\Phi^{-1}_{nk}]{} \Gamma \in GF(2^n)$$

$r(\alpha) \in$ Galois Field $GF(2^{n-k})$,

Φ^{-1}_{nk} : Mapping given by combining $M(\alpha)$ and $r(\alpha)$ in series and Permutation between them.

$\Gamma \longmapsto C = \{C_i(M)\}$

Multiply Γ by γ^x and get C (M):
$C_i(M)$ is the ith order coefficient of C(M) in GF(2^n)(i=0~n-1).

H (X) : Primitive polynomial in G F (2^n),
γ : Primitive Root of H (X) ;
$x \in N = \{0,1,2,\cdots\}$

End

FIG. 3

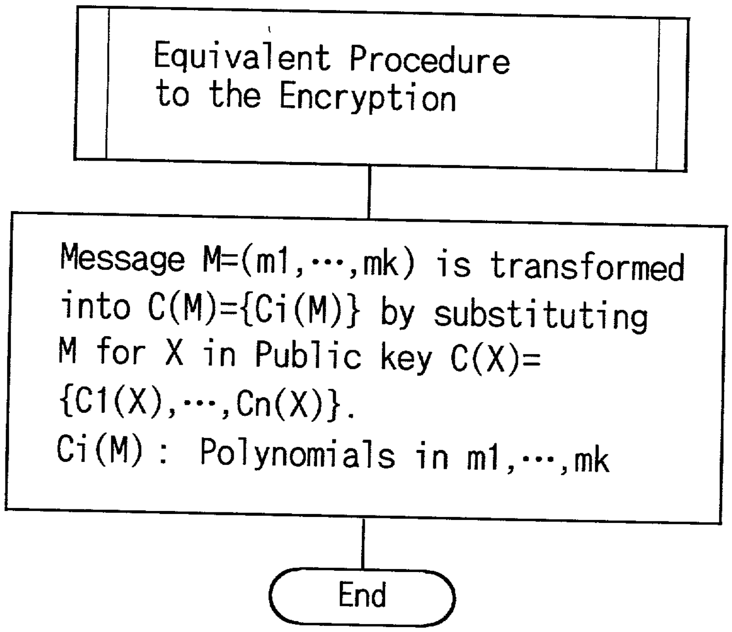

Equivalent Procedure to the Encryption
Message M=(m1,…,mk) is transformed into C(M)={Ci(M)} by substituting M for X in Public key C(X)={C1(X),…,Cn(X)}.
Ci(M) : Polynomials in m1,…,mk
End

FIG. 4

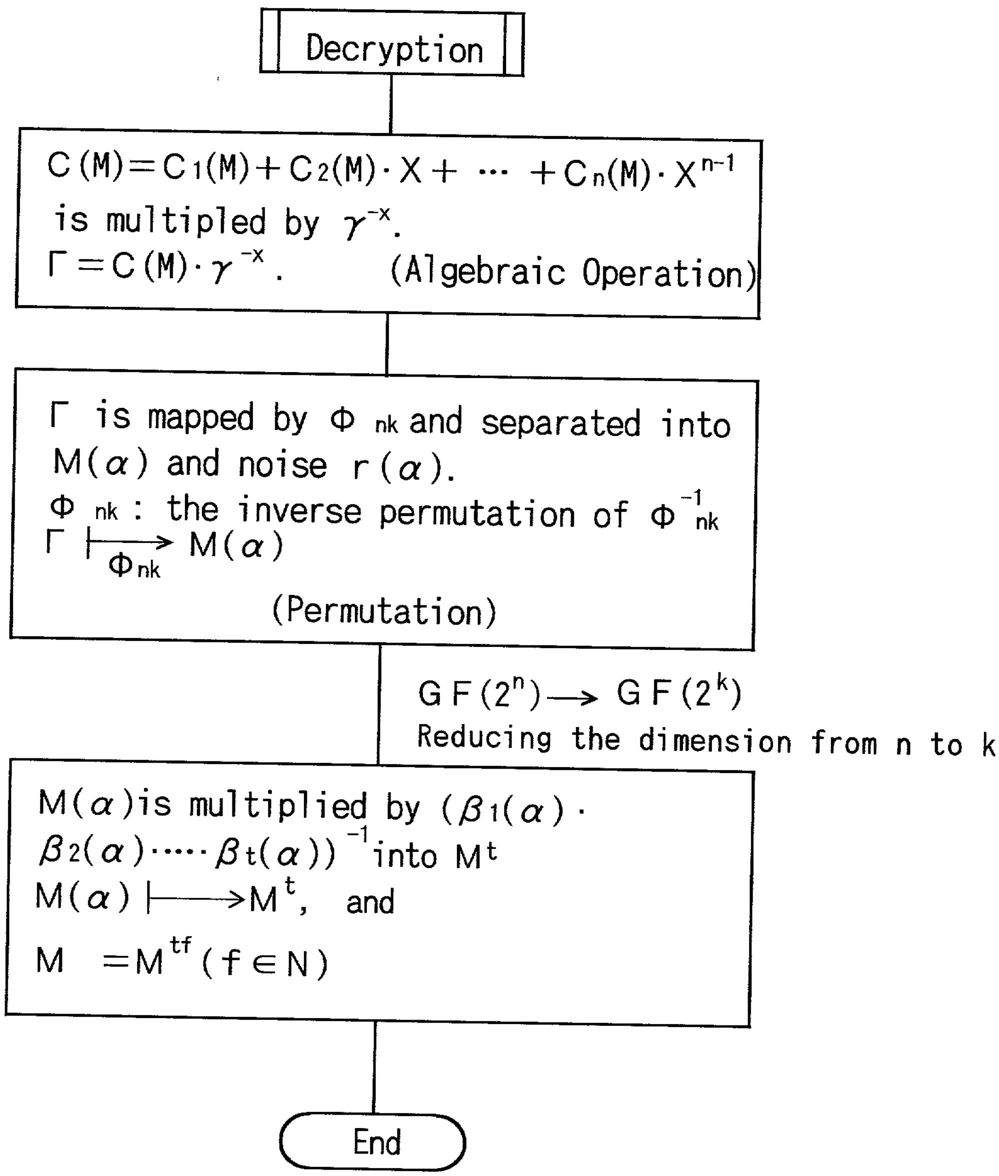

Decryption
$C(M)=C_1(M)+C_2(M)\cdot X+\cdots+C_n(M)\cdot X^{n-1}$
is multipled by γ^{-x}.
$\Gamma=C(M)\cdot\gamma^{-x}$.
(Algebraic Operation)
Γ is mapped by Φ_{nk} and separated into
$M(\alpha)$ and noise $r(\alpha)$.
Φ_{nk} : the inverse permutation of Φ^{-1}_{nk}
$\Gamma \xmapsto[\Phi_{nk}]{} M(\alpha)$
(Permutation)
$GF(2^n) \longrightarrow GF(2^k)$
Reducing the dimension from n to k
$M(\alpha)$ is multiplied by $(\beta_1(\alpha)\cdot\beta_2(\alpha)\cdots\cdots\beta_t(\alpha))^{-1}$ into M^t
$M(\alpha) \longmapsto M^t$, and
$M = M^{tf} (f \in N)$
End

FIG. 5

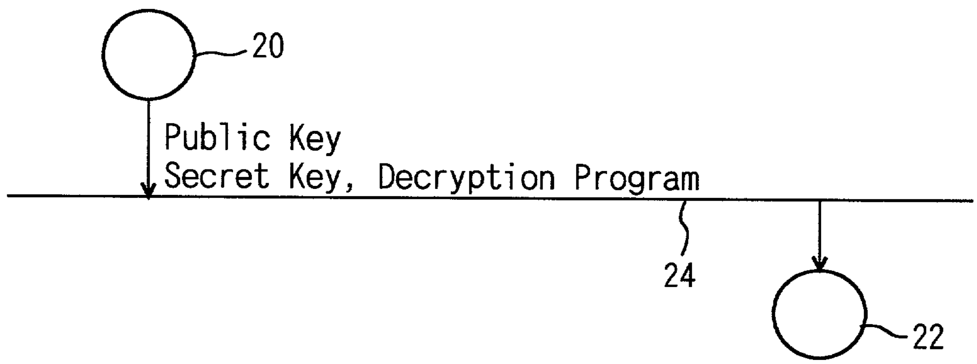
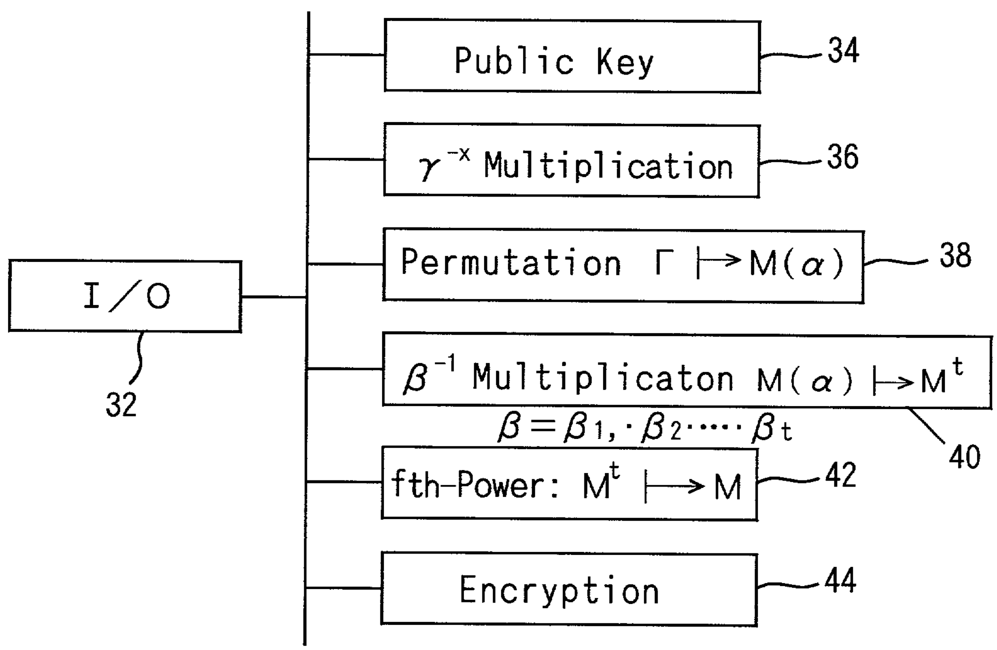

20
Public Key
Secret Key, Decryption Program
24
22

FIG. 6


Public Key
34
γ^{-x} Multiplication
36
Permutation $\Gamma \mapsto M(\alpha)$
38
I/O
32
β^{-1} Multiplicaton $M(\alpha) \mapsto M^t$
$\beta = \beta_1, \cdot \beta_2 \cdots\cdots \beta_t$
40
fth-Power: $M^t \mapsto M$
42
Encryption
44

30